ACUTE GENERAL PERITONITIS*

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A RATIONAL THERAPEUTIC REGIMEN

THE treatment of general peritonitis differs from that of most intra-abdominal lesions in one major aspect which is not generally enough appreciated and which is the keystone to rational and successful therapy. The feature which differentiates it from other lesions is this: the disease and its involved area cannot be treated directly. Only when this is recognized, understood and taught, will peritonitis be coped with properly according to the means now available. The present trend of abdominal surgery is to locate and attack directly the diseased organ, the appendix, stomach, intestine, biliary apparatus, pancreas, spleen, and pelvic organs being numbered among the intra-abdominal viscera which we so treat. The peritoneum, if for no other reason, is eliminated from direct therapy because of its extent.

Granting that the involved area cannot be treated directly, we must then launch our therapeutic attack in other directions, and these are, first, the elimination of the cause, and second, the neutralizing of the harmful influence of the four handmaidens of peritonitis, namely, gastric dilatation, ileus, toxemia, and dehydration.

ELIMINATION OF INCITING CAUSE OF PERITONITIS

The phase of therapeutics involving elimination of the inciting cause needs little discussion. It is generally recognized, and rightly, that the exclusion of a source of constant reinfection is most essential in the proper treatment of infections in large cavities. Hence the removal of a gangrenous appendix, the closure of a perforation, the elimination of a draining focus in rupture or gangrene of the gall bladder and the exteriorization or resection of gangrenous bowel are of paramount importance in removing the cause of peritonitis. Here our intraperitoneal therapy should end. By this I mean that drainage is unnecessary and actually harmful in general peritonitis and that the only excuse for the use of abdominal drains is in creating a path of least resistance for the evacuation of a walled-off abscess. The common use of drains in the peritoneal cavity is a bad habit handed down to us and practiced through fear or ignorance, because it has been done by others before us.

In 1905 a comprehensive study of abdominal drainage was published by Yates.[1] His conclusions were sound and his work warrants more attention than has apparently been given it. The following conclusions can be drawn from his work:

1. Drainage of the general peritoneal cavity is physically and physiologically impossible.

2. The relative encapsulation of the drain is immediate, while the absolute encapsulation occurs early (less than six hours in dogs) and can be retarded but not prevented.

3. The serous external discharge is an exudate due to irritation of the contiguous peritoneum by the drain.

4. There is a similar inward current from the potential cavity about the drain to the general cavity.

5. Adhesions, under approximately normal conditions, form about any foreign body, their extent and density depending upon the degree and duration of the irritation.

6. Primarily fibrinous, these adhesions become organized in a few days (three in dogs), and if irritation persists they become progressively more mature fibrous tissue.

7. After irritation ceases, their disappearance depends mainly upon mechanical factors—the ability of the involved surfaces to pull themselves or be pulled apart.

8. A drain in the presence of infection is deleterious to peritoneal resistance.

In the light of these conclusions one can see that attempts to drain the peritoneal cavity are not only futile but harmful in that they leave a potential menace in the form of adhesions. This point is graphically illustrated by Meyer,[2] who reports that 78 per cent of ninety-five cases of acute intestinal obstructions in his series were due to adhesions from previous operations. Even assuming the correctness of Horsley's [3] contention that drains reverse the lymph flow we are still unjustified in their use because recent work tends to show that the toxins we attempt to eliminate by drainage are intra-intestinal rather than intraperitoneal.

NEUTRALIZATION OF TOXEMIA

Having considered the elimination of the infecting focus, the first line of attack in our treatment, we are ready to combat those influences of peritonitis which are its weapons of destruction, namely, those pathological changes leading up to and causing toxemia. In this field, particularly, are we guided by recent research work of clinical and experimental nature which points out that our problem now becomes the same as dealing with intestinal obstruction. The symptoms, blood chemistry and findings in general are identical in the two conditions. The clinical similarity of the two conditions was thoroughly recognized even before the physiological chemists had demonstrated the parallel courses by blood chemistry. Moynihan had said "There is no appendicitis without obstruction," and this statement, if true

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of appendicitis, is multiplied many fold when applied to peritonitis."

Upon the cause of toxemia in these conditions much light has been thrown by recent work. David[4] has shown that while bacteria will pass directly into the blood and lymph streams from a normal peritoneum or one containing ascitic fluid, a well-developed plastic peritonitis will prevent this passage. Lesser grades of peritonitis, he has shown, prevent passage into the blood stream but not into the lymphatics and thoracic duct. He concludes that the main problem in peritonitis is not one of septicemia or bacteremia.

Ellis[5] has recently published an exhaustive work on the nature of the toxin in obstruction and has coördinated the theories of the foremost workers in this field. A summary of his findings is as follows: (1) A poison can be isolated by extraction and precipitation from the intestinal content in high obstruction, which is neither a proteose nor heteroproteose. (2) It is not possible to obtain this toxin from normal intestinal content. (3) The poison is identical, judged by means at our disposal, to that found in other conditions such as after adrenalectomy, in portal obstruction, acute pancreatitis, and experimental acute fulminating, nonbacterial peritonitis. (4) The toxin is undoubtedly in the cells of the greater part of the mucosa of the small intestine, but chiefly of the *duodenum,* and is manifestly excreted into the lumen of the intestine, but the larger part into the lymphatic stream. (5) The clinical advantage of gastric lavage may be explained by the removal of the toxic content, favoring thereby an increased excretion into the lumen of the intestine rather than into the lymphatics.

Whether we agree with Bouchard[6] that the poison is of fatty acid origin; with Nesbitt[7] that it is neurin; with Clairmont[8] and Murphy[9] and others that it is of bacterial origin; with Dragstedt[10] that it is from putrefactive action of bacteria; with Whipple[11] that it is heteroproteose in nature, or Williams[12] that it is an anaërobic toxin, the essential point in treatment is the removal of the toxic substance so that it may not be absorbed.

A host of observers have recently advocated enterostomy as the essential procedure in elimination of toxemia. Some have based this procedure on well-controlled experimental work and others have done it empirically because good results have been obtained. Whereas the original advocates of enterostomy chose a point low on the intestine, the recent trend has been to drain higher because results were more satisfactory and because it has been found that the toxic factor is more abundant in the upper small gut. Clute,[13] in reporting his clinical results in a series of these cases, finally decided that "the higher the drain is inserted in the small gut the better the opportunity of draining the toxic products of obstruction."

In peritonitis or obstruction Macrae[14] recently advocated a high jejunostomy as the procedure of choice. He makes a plea for prophylactic jejunostomy in cases where trouble may be expected following the primary operation. When the patient's condition is so extreme as to make hazardous the elimination of the infecting focus he contents himself with jejunostomy alone. His argument is well presented and convincing, but it will be hard for any surgeon to relinquish treatment based on so sound a fundamental principle as that of removing the original focus. If you become convinced, as I have, that this principle of intestinal drainage is a sound one and still are unwilling to allow your desperate risk abdominal case to fight with the poorest of weapons against a focus which can be eliminated surgically, you will strive to accomplish both tasks. And, further, if you could accomplish the drainage of the upper intestinal tract without operation you would consider that your first duty to the patient.

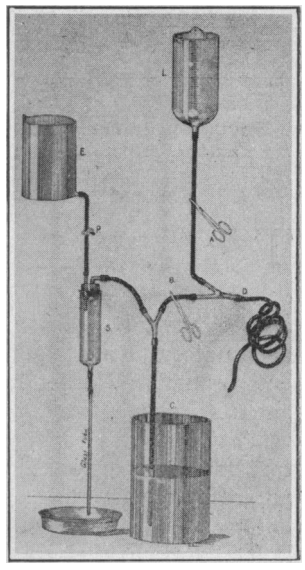

Fig. 1.—Apparatus for continuous gastric drainage. D, Levin duodenal tube No. 14 French, to be slipped through nostril; A, hemostat clamped on tube to lavage solution L, which is changed to B only during lavage; C, drainage tube, the end of which must be kept submerged; S, Connell suction apparatus, the barrel of a triumph syringe fitted with a two-holed rubber stopper. Constant dripping from container E, regulated to about 100 drops per minute by petcock P, causes a mild negative pressure due to the air bubbles carried down the glass tube between drops of water.

DESCRIPTION OF APPARATUS FOR CONTINUOUS GASTRIC AND DUODENAL LAVAGE

Herein lies my reason for presenting this paper. In 1925 I described an apparatus for continuous gastric and duodenal lavage.[15] There was nothing original or new in any of the ideas involved except that two frequently used medical procedures were combined into an effective method. My reason for describing the mechanism was that I felt tremendous good would be done as soon as the procedure was universally adopted. I still feel this, and I am making a second plea with more than a simple description of the apparatus. My entire attitude and prognosis in regard to general peritonitis has been changed by its use. In former years we had our share of deaths from general peritonitis while a recent survey shows that in the last four years we have not had a single death from peritonitis not complicated by other conditions such as pneumonia, septicemia, or the like.

In a few words, it is a continuous duodenal and gastric lavage by means of a small tube passed through the nostril and attached to a mechanism for continuous mild suction. The apparatus, as shown in the illustration, consists of a so-called Connell suction attached to a duodenal tube. This

tube may be the type proposed by Jutte or Levin and popularized by Matas,[16] but may be improvised simply by introducing a few lead shot as weight into the end of a long Dakin tube with multiple perforations extending for a few inches from the tip. Any tube that can be slipped easily through the nostril will do, but I have found the catheter-tipped Levin duodenal tube, No. 14 French, most satisfactory. All the paraphernalia may be found on hand in any hospital.

The constant dripping from the receptacle (E) produces a mild suction which is comparable to simple siphonage with the advantage that this negative pressure is maintained even after the siphon action may have been destroyed by passage of gas from the stomach. By the use of this apparatus the stomach, duodenum, and upper jejunum can be kept continuously empty of fluid and gas. The relief of bowel distention in this manner overcomes obstruction to a large extent as shown by Gatch,[17] who points out that distention alone will cause necrosis when the pressure within the loop reaches that of the venous pressure. It has all the advantages of a jejunostomy without the disadvantage of an extra surgical procedure in a bad risk case, and, further, the amount and rate of drainage may be exactly controlled, thus eliminating the possibility of persistent dehydration due to jejunal fistula after removal of toxins has been accomplished. Ease of accomplishment and a minimum of discomfort to the patient are two of its attributes. In fact, the comfort obtained by relief from vomiting and distention has made many of my patients beg for its continued use when removal was suggested.

Since the value of Haden and Orr's [18] blood chemistry work has been recognized and their methods of combating toxicity in intestinal obstruction have been put into effect we have come to realize more than ever the importance of a high sodium chlorid intake. These authors have shown that administration of salt solution in large amounts will not only prevent the fatal drop in the blood chlorids but will tend to bring down to normal levels the urea and nonprotein nitrogen. They have prolonged life and brought blood chemistry back to normal by administration of salt solution subcutaneously and by mouth in experimental obstruction. They decided that sodium chlorid has a specific action, not obtained by glucose or other agents, in preventing and controlling the changes produced by the toxin.

With these principles in mind our patients are given daily from 3000 to 8000 cubic centimeters of normal saline solution subcutaneously during their stage of ileus and 4 per cent salt solution is used frequently for lavage through the duodenal tube, thus applying our antitoxic agent directly in the area of known toxic absorption. Our use of glucose solutions intravenously is infrequent compared with subdermal saline therapy. Until the obstructive stage of peritonitis is passed, nourishment, if given at all, is furnished by continuous rectal drip instillation of glucose solution allowing at the same time for the passage of flatus.

Other features of treatment are the avoidance of any attempts to promote peristalsis and the encouragement of intestinal immobility by use of morphin and opium. No attempts to obtain bowel action other than gas-eliminating enemas and rectal tube are used, and the enemas are withheld until the patient's condition indicates complete mastery of the peritoneal infection. Additional comfort to the patient may be obtained by the semireclining (knees slightly flexed) position with its consequent removal of abdominal and diaphragmatic tension. Large hot stupes are applied over the entire abdomen, and these are much appreciated by the sufferer.

SUMMARY

To summarize those measures which we consider essential to the proper treatment of peritonitis we have:

1. Elimination of the cause with as little manipulation and trauma as possible, which means, of course, without the use of any foreign material in the form of drains.
2. Continuous transnasal duodenal and gastric drainage with frequent saline lavage during the stage of dilatation and ileus, this to be instituted at the first sign of distention and continued till the tone of the bowel is restored, as shown by the rapid absorption of saline solution introduced through the tube.
3. The administration of large amounts of normal saline solution beneath the skin to maintain fluid balance and the proper level of blood chlorids.
4. Morphin and opium as demanded for comfort, quiet and peristaltic inactivity.
5. Maintenance of a comfortable position, usually the semi-Fowler, with application of moist external heat to the abdomen.

Of all these procedures, after elimination of the focus, we feel continuous drainage is the most important, and I repeat the sentiment of Bassler [19] expressed a few years ago to a meeting of the Southern Medical Association. If I leave you nothing more than an appreciation of the life-saving value of continuous gastric and duodenal lavage, my work has been well done.

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REFERENCES

1. Yates, J. L.: An Experimental Study of Local Effects of Peritoneal Drainage, Surg., Gynec., Obst., 1, 473, 1905.
2. Meyer, K. A., and Brams, W. A.: A Clinical Study of Acute Intestinal Obstruction, Illinois M. J., 51, 43, 1927.
3. Horsley, J. S.: Surgical Drainage from a Biologic Point of View, J. A. M. A., 74, 159, 1920.
4. David, V. C.: Peritonitis—An Experimental Study, Surg., Gynec., Obst., 45, 287, 1927.
5. Ellis, J. W.: The Cause of Death in High Intestinal Obstruction, Ann. Surg., 75, 429, 1922.
6. Bouchard—quoted by Ellis.
7. Nesbitt, Beattie: On the Presence of Cholin and Neurin in the Intestinal Canal During Complete Obstruction, J. Exper. Med., 4, 1, 1899.
8. Clairmont, P., and Ranzi, E.: Zur Frage der Autointoxication bei Ileus, Arch. f. klin. Chir., 73, 696, 1904.
9. Murphy, F. T., and Brooks, Barney: Intestinal Obstruction, Arch. Int. Med., 15, 392, 1915.

10. Dragstedt, L. R., Moorhead, J. J., and Burcky, F. W.: Intestinal Obstruction, J. Exper. Med., 25, 421, 1917.

11. Whipple, G. H., Rodenbaugh, F. H., and Kilgore, A. R.: Intestinal Obstruction, J. Exper. Med., 23, 123, 1916.

12. Williams, B. W.: Importance of Toxemia Due to Anaërobic Organisms in Intestinal Obstruction and Peritonitis, Brit. J. Surg., 14, 295, 1926-27.

13. Clute, H. M.: Enterostomy in Peritonitis, S. Clin. North America, 8, 129, 1928.

14. Macrae, Donald Jr.: Management of Acute Conditions of the Abdomen, J. A. M. A., 89, 1113, 1927.

15. Ward, Robertson: An Apparatus for Continuous Gastric or Duodenal Lavage, J. A. M. A., 84, 1114, 1925.

16. Matas, Rudolph: The Continued Intravenous Drip, Ann. Surg., 79, 646, 1924.

17. Gatch, W. D., Trusler, H. M., Ayres, K. D.: Causes of Death in Acute Intestinal Obstruction, Surg., Gynec., Obst., 46, 332, 1928.

18. Haden, R. L., and Orr, T. G.: The Effects of Sodium Chloride on the Chemical Changes in the Blood of the Dog after Pyloric and Intestinal Obstruction, J. Exper. Med., 38, 55, 1923.

19. Bassler, Anthony: The Use of the Duodenal Tube, South. M. J., 12, 4, 1919.

DISCUSSION

FRANK W. LYNCH, M. D. (University of California Hospital, San Francisco).—Doctor Ward's contribution is exceedingly timely, first, because he emphasizes the futility of surgery in the treatment of acute general peritonitis and, secondly, because he redescribes the apparatus which has proved so helpful to all who know it and which has enabled them to treat rationally a group of cases which must always remain large because there are so many different conditions which may terminate in acute general peritonitis.

At first sight there would seem to be no need of even mentioning surgery as a possible method of treating general peritonitis because leading surgeons gave it up years ago. They had reason so to do because the clinical results were uniformly bad and because experimental work had proved that so-called drainage after incision was not only futile in principle, but was actually more dangerous to the patient in practice than any conservative method. Murphy's teaching did much to drive this lesson home. Yet many who attempt surgery even now do not appear to have learned these facts but continue to operate the general peritonitis case, after the offending focus has been removed, and fill the abdomen with so-called drains, often without the criticism of their better informed colleagues. Therefore Doctor Ward's comments are very much worth while.

The work of Whipple, Hartwell, McKenna, and others has shown that the intestinal secretion is extremely toxic in intestinal obstruction and that it is usually responsible for death if it supervenes: moreover, they showed that the secretion is identical in peritonitis, and in mechanical or in paralytic ileus. They demonstrated the need of gastric and duodenal lavage for any condition presenting vomiting and dilatation of the stomach and intestines. The stomach tube has proved of much value in such conditions, yet the shock of passing a large tube often proves considerable to a sick woman. The small duodenal tubes which can be passed through the nose do not have this objection. Moreover, they can be left in place for several days without occasioning marked discomfort. Yet the tube alone is not of the greatest help. Doctor Ward uses the nasal tube together with the Connell type of suction in an apparatus which makes it possible for one nurse to carry out instantly one of several procedures that otherwise would keep a physician and nurse busy for more than half an hour out of every four. The essayist has reviewed in his paper the arguments which have convinced all of us who use his apparatus that this method of treatment does all that a jejunostomy can do and without the fundamental objections attendant upon surgery, such as operative shock, the dehydration that may attend the establishing of the fistula, and the fact that such treatment may require subsequent surgery for cure.

The apparatus enables the nurse to use any medication that can be given in solution and has proved of the very greatest value for several years to the many of us who work in the University of California Hospital.

WAYLAND A. MORRISON, M. D. (1037 Pacific Mutual Building, Los Angeles).—Doctor Ward's apparatus is easily set up and has many advantages. I have used duodenal drainage by means of a nasal catheter for several years. It is the best method of relieving the distressing symptoms of high obstruction which often follow in cases of this type. Doctor Ward's results have been remarkable, and I feel should warrant the use of this method in all cases where it is indicated.

I have always felt that the usual method of draining general peritonitis cases does more harm than good. This is especially true when cigarette drains, with protruding gauze, are used. The wad of gauze causes a severe reaction and is useless. I heartily approve of the method of not attempting drainage in these cases.

I note that Doctor Ward is using glucose by rectum. It has been our experience in the Santa Fe Hospital, and has lately been proved by Dr. J. Pressman in our clinic, that glucose is only slightly absorbed by the large bowel. It has rather a tendency to ferment, and that portion which is not reduced in this way is usually expelled. We believe, therefore, that it is a disadvantage rather than an advantage to the patient. Glucose by rectum apparently stimulates the pancreas and causes a hyperinsulinization, with the resulting increased metabolism. The blood sugar is thus lowered. We feel that glucose solution should be given either into the vein or subcutaneously, and that the chlorids be kept up by saline solution by rectum, and in the manner suggested by Doctor Ward.

PSYCHIATRY IN A GENERAL HOSPITAL*

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PSYCHIATRY, formerly but a stepchild in the family of the medical sciences, is demanding full membership in the family circle and a voice in its affairs.

The concession of this equality brings with it new responsibilities requiring more extended preparation in neurology, psychiatry and psychology, and closer touch, not only with general medical practice, but also with the affairs of the community, upon the part of the psychiatrist, who has now become "neuropsychiatrist."

Not the least of his activities are in connection with the general hospital, where his technical knowledge and experience can be utilized to good effect in the many problems of such an institution.

UNDERLYING FACTORS IN MENTAL PHENOMENA

Mental phenomena are in the main reactions to stimuli from within and from without and are conditioned, in the first place, by the original con-

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